Original Research Article

Efficacy of TVS colour doppler in comparison of primary infertility with endometrial biopsy

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Abstract

Background: Accurate prediction and diagnosis of uterine abnormalities has become a core part of the fertility work-up. A variety of modalities can be used for the diagnosis of uterine abnormalities Transvaginal ultrasonography (TVS) is one among all.

Aim: To determine the efficacy of TVS ultrasonography in screening for endometrial disease and studied the concordance of abnormal endometrial thickness, as measured by ultrasonography, with diagnoses based on histopathological examination of endometrial biopsy specimens.

Materials and methods: A total 200 Subjects were elected from OPD of ESIC Hospital, Hyderabad. All subjects were undergone to the routine clinical and blood investigation, ultrasound, transvaginal and colour doppler investigations.

Results: Study of primary infertility the diagnosis by transvaginal ultrasound and histopathology matched in 82% cases, while in 18% cases there was a disparity among the two modes of investigation.

Conclusion: TVS can play an effective role in diagnosis and management of primary infertility, as it has a greater patient compliance with non-invasive technique and without necessitating full bladder. It can replace the EB in the diagnostic work up of female infertility.

Key words

Transvaginal ultrasonography (TVS), Endometrial biopsy, Uterine cancer, Primary infertility.

Introduction

Infertility is one of field which has been revolutionized greatly both in diagnostic as well as therapeutic modalities in the past decades. However, despite improved diagnostic modalities the factor leading to infertility in nearly 10-15% in rigorously evaluated couples remains unexplained. The treatment of unexplained infertility remains a challenge [1].

The main causes of infertility are anovulation in 10-30% cases, tubal factor in 15%, male factor in 20-30% cases, cervical factor in 25%, endometriosis in 5-15%, and unexplained causes in 15-30% of cases [2]. Poor quality embryo, higher age of the patient, unexplained infertility and unfavorable endometrium are some of the factors for implantation failure following IVF-ET. Once the uterine lesion is suspected clinically, sonography can be used to establish the extent of lesion by studying the endometrial pattern and vascularity. The diagnosis can be further helped by endometrial biopsy [3].

Pelvic ultrasound is considered to be clinically integral to the transvaginal examination and does not warrant separate reimbursement. A transvaginal ultrasound (TV-US) provides superior detail in images of pelvic structures and this may even become the first step examination in obstetrics and gynecology. When TV-US is performed on a patient whose pelvic structures are within the bony pelvis, pelvic echography using an abdominal approach is duplicative of the TV-US [4, 5].

TV-US is a useful and first line investigation tool available to gynecologists to assess the causes of female infertility and to institute some of the treatments used to ameliorate infertility. TV-US is an effective, safe, inexpensive, radiation free, non-invasive tool, readily available, easy to use and easily repeatable approach to evaluate female infertility worldwide [6]. It improves the quality of care provided in female infertility workup by facilitating rapid diagnosis and the visualization of changes in female reproductive physiology required to direct therapy [7, 8].

Present study was done to determine the usefulness of ultrasonography in screening for endometrial disease and studied the concordance of abnormal endometrial thickness, as measured by ultrasonography, with diagnoses based on histopathological examination of endometrial biopsy specimens.

Materials and methods

The present study was carried out in the Department of Obstetrics and Gynecology in association with Department of Pathology, ESIC Hospital, Hyderabad, India. A total 200 subjects were chosen from outpatient section of department of Obstetrics and Gynecology with complaints of primary infertility and all the patients were gone through regular follow-up.

Inclusion criteria
- Reproductive period of life (18to 40 years).
- With stenosed vagina.

All cases included in the study were postally interrogated, were subjected to detailed clinical history and examination and taken consent from each. All the patients underwent Transvaginal colour Doppler sonography and endometrial biopsy in the same sitting.

Investigations
Each patient was undergone with detailed clinical examination and routine investigation like Blood Hb, TLC, ESR, Blood urea, complete urine examination, Blood sugar, VDRL (Husband and wife), TORCH and Husband's seminogram.

Ultrasonography
Patients were subjected to Transvaginal sonography using a transvaginal probe to visualize the structures in a systemic manner.

Transvaginal probe
The convex linear array intravaginal transducer is a 3.5 MHz convex probe with a radius of curvature of 11.0 mm.

Colour Doppler Study

The vascular pattern of uterine artery during systole was studied to predict fertility out come in infertile patients using following indices:

- SD Ratio = Peak systolic doppler shift frequency/ Least diastolic doppler shift frequency
- Pulsatility Index(PI) = S- D/ Mean
- Resistance Index(RI) = S- D/S

S= Peak systolic frequency shift, D= End-diastolic frequency shift mean =mean height over one cardiac cycle.

Endometrial Biopsy

Endometrial biopsy was taken following ultra sound examination is all cases in the premenstrual phase an endometrium was studied for its histopathological findings.

Results

The present study was carried out in the Department of Obstetrics and Gynecology in conjunction with Department of Pathology ESIC Hospital, Hyderabad. A total of 200 patients with primary infertility underwent this study. Age of the patients is our study ranged from 18 to 40 years. In the study group maximum number of cases were in the group of 21 – 25 years (56% cases), followed by 26 – 30 years (25% cases) and 18 – 20 years (12% cases). Two cases were above 35 years of age. No case below 18 years was included as vaginal sonography cannot be done is there cases.

Most of the cases (54%) belonged to group III (Low) socioeconomic status and (40%) in middle class. Only (6%) of the patients belonged to group I or high class (**Table - 1**).

Table – 1: Distribution of cases according to demographic and economic status.

Study Group	Socioeconomic Status			Rural	Urban
	I (High)	II (Middle)	III (Low)		
Number	12	80	108	128	72
Percentage (%)	6	40	54	64	36

In related to the duration of infertility maximum number of patients in study group 61% had 1-5 years, 37% had 6-10 years and only 2% had 16-20 years infertility. Endometrial characters by TVS were as per **Table – 2**.

In the maximum number of cases i.e. 37% had endometrial thickness in the rage of (9-12) mm, followed 34% cases in the range (6-9) mm. 21% of cases had endometrial thickness ranging from (12-15) mm featuring late secretory transformation. 6% of cases showed endometrium in (3-6) mm range; and only 1% cases each in (15-18) mm and (18-21) mm range. The mean thickness of endometrium in 200 cases studied was found to be 9.9 mm ± 2.9 mm standard deviation.

TVS of endometrium done in premenstrual phase revealed that most of the cases i.e. 65% showed secretory or ovulatory phase, and 32% showed proliferative or anovulatory phase. Out of 65% showing secretory transformation, 37% cases revealed late secretory transformation and 28% had early secretory changes. Of the 32% cases showing proliferative transformation, 16% had late proliferative changes, and rest 16% had early proliferative changes. 3% of the cases showed intrinsic abnormalities of the uterus. Of these, 2% cases had fibroid uterus and 1 case showed presence of endometrial polyp.

Study of uterine artery Doppler flow parameters like resistance or pourcelot index (RI) and Pulsatility index (PI). In the study group, most of the cases (88%) showed resistance index in the range of 0-1.0. which is normal feature and 12% cases showed RI>1.0, which indicates there was either decreased or no flow in the uterine artery during the diastolic phase of cardiac cycle.

Among 200 cases 56% showed PI in the range of 1-2 and 36% showed in range of 2-3, which indicates that uterine artery flow during both systolic and diastolic phases was adequate. 8% showed PI > 3. (**Table - 3**)

Table – 2: Endometrial characters by TVS.

Endometrial characters	Study Group	
	Number	**%**
Echogenecity		
Anechoeic	10	5
Hypoechoeic	34	17
Isoechoeic	16	8
Hyperechoeic	140	70
Contractions		
Present	92	46
Absent	108	54
Triple Line Appearance		
Present	72	36
Absent	128	64
Vascularity		
Normal	174	87
Decreased/Ab (N)	26	13

Table – 3: Histopathological finding of endometrial biopsy in cases of primary infertility.

Diagnosis	Study Group	
	No.	**%**
Phase		
Proliferative	56	28
Secretory	138	69
Endometrial Hyperplasia		
Simple Hyperplasia	2	0.01
Benign Cystic Hyperplasia	1	0.005
Tubercular Endometrities	3	0.015

Correlation of menstrual patterns with histopathology of endometrium was as per **Table – 4**. Study of primary infertility the diagnosis by transvaginal ultrasound and histopathology matched in 82% cases, while in 18% cases there was a disparity among the two modes of investigation.

Discussion

In the present series of 200 cases, histopathological, study of endometrium revealed normal secretory change in 69% cases, and proliferative changes in 28% cases, endometrial hyperplasia in 0.015%, and tubercular endometritis in remaining 0.015% cases. Our results correspond with the study done by Sharma and Menon, et al. Endometrial dating by Rastogi, et al. showed that the ideal time of endometrial biopsy is from 24th to 26th day of cycle i.e. in the premenstrual phase [4, 9].

In the present study, there is significant correlation of endometrial characters between transvaginal Doppler findings and histological findings. Out of total 56 cases that showed Type I endometrium on TVS, proliferative changes were present in 48 cases on histopathology. Out of 8 cases, who should Type II endometrium on TVS, 6 cases revealed proliferative changes on histopathology. Out of 118 cases showing secretory changes on histology, 80 cases had Type III endometrium on TVS, 32 cases had type IV endometrium, and 6 cases had type 1 endometrium. Two case which showed benign cystic hyperplasia on histopathology revealed Type II endometrium on TVS.

In our study, diagnosis in cases of primary infertility by TVS and histopathology correlated in 82% cases, while in 18% cases there was negative correlated among the two procedures. On histology, out of 11 cases, 7 cases which showed secretory phase on TVS were found to have proliferative changes, 4 cases which showed proliferative phase on TVS revealed secretory changes on histopathology; and the remaining 4 cases showed tubercular endometritis instead of secretory phase, as seen with TVS.

According to Padubidri, et al.; Montgomery, et al.; Haq, et al.; Woo Joseph, et al.; Weissman, et al.; Schwimer, et al.; Kaproth-Joslin, et al.; only shows the hormonal response of endometrium, it

also gives information about local factors concerning atrophy, specific and non- specific infections and malignancy. In several series is which endometrial biopsies were performed on infertile women the incidence of performing a biopsy during a conception cycle ranged from 1.2% to 4%. The risk disrupting the pregnancy by causing trauma and bleeding at implantation site ranges from 4% to 20%. Therefore the major disadvantage with endometrial biopsy is that it is an invasive procedure. Moreover, whereas TVS can screen other pelvic organs as well for related pathologies in a single scan of few minutes, EB does not provide any information regarding myometrial and adnexal pathologies or vascular characters [3, 5, 6, 10-13].

Table – 4: Correlation of menstrual patterns with histopathology of endometrium.

Histopathological Findings	Study Group				
	Menorrhagia	Polymenorrhoea	Oligome norrhoea	Acyclical	Regular
Proliferative Phase	15	12	4	14	11
Secretory Phase	13	6	24	6	89
Simple Hyperplasia	2	-	-	-	-
Benign cystic Hyperplasia	-	-	-	1	-
Tubercular Endometritis	-	-	3	-	-

Thus, TVS can play a major role in diagnosis and management of primary infertility, as it has a greater patient compliance with noninvasive technique and without necessitating full bladder. It can very well substitute EB in the diagnostic work up of female infertility.

Conclusion

TVS is an accurate diagnostic tool for cases presenting with primary infertility. It is a non-invasive OPD procedure, not requiring full bladder. In addition to excluding organic lesions and other adnexal pathologies, endometrium can be studied in detail and fairly accurately. TVS has correlated well with histopathology in diagnosing proliferative or secretory endometrium, endometrial hyperplasia or atrophy. So it can be nearly and accurately replace the invasive check curettage done for diagnostic purposes.

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